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Using the Prisoner's Dilemma to Evaluate Personality Indicators of Cooperation

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Using the Prisoner's Dilemma to Understand Personality Indicators in Cooperation

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Abstract

Cooperation has been seen as a key contributor to forming close relationships. Loneliness and perceived risk in intimacy have been associated with having fewer close interpersonal bonds. The type of interaction (communal or exchange) also plays a role in how people will behave, and how open they will be in pursuing a close relationship. The authors used a manipulation of the type of relation a participant would have with a confederate in a Prisoner's Dilemma game, and measured perceived risk in intimacy and loneliness, to evaluate the effects these factors had on cooperative behavior. The authors found that the effects of loneliness on cooperation were marginally dependent on level of risk in intimacy. In addition, the authors found that the effects of perceived risk in intimacy on cooperation were marginally dependent on the relation condition. Implications of the null findings reveal that lonely people's cooperation may depend on how much risk they perceive in possible intimacy. These findings also imply that lonely people may cooperate more in exchange relationships than in communal relationships. Future studies might explore the two marginal associations, but also measure these three factors against interpersonal trust. Trust may be a more encompassing dependent variable that is equally important in relationship building, and may be complemented by cooperative behavior, among other acts showing signs of trust.

Using the Prisoner's Dilemma to Evaluate Personality Indicators of Cooperation

Close relationships require cooperation to succeed. Wish, Kaplan, and Deutsch (1976) evaluated important dimensions of interpersonal relationships. They found that close interpersonal bonds—such as close friends, spouses, co-workers, and siblings—can be associated with cooperation and friendliness. Unfortunately, some individuals struggle to form these types of cooperative relationships. The current experiment focuses on why people may face difficulties in cooperating with others. Several personality traits are proposed as possible indicators of individuals who fail to form cooperative relationships.

One of the primary factors being evaluated in assessing struggles to cooperate is perceived risk in intimacy. Perceived risk in intimacy reflects an individual sensitivity to potentially bad outcomes from seeking affectionate interactions (Pilkington & Richardson, 1988). Perceived risk in intimacy is associated with involvement in close relationships, trust, and openness to love (Pilkington & Richardson, 1988). A series of studies by Pilkington and Richardson (1988) investigated the concept of perceived risk in intimacy, the first of which employed a 10-item Risk in Intimacy Inventory (RII) that measures people's fear of romantic relationships and trust. Someone who scores high on this scale is likely to be more afraid of being vulnerable to someone in a close, intimate relationship. The researchers found that participants who scored highly on the RII scale reported lower self-esteem, fewer friends, and less trust in others. They also found that high risk perceivers reported being less sociable; these people reported that they were less extroverted and that they lacked assertiveness in dating situations.

Pilkington & Nezlek (1994) hypothesized that greater risk in intimacy would be associated with less rewarding social lives and less socio-emotional satisfaction (closeness with

others and depth of connection). The researchers found that high scorers on the RII scale reported a less satisfying set of social interactions. Their interactions were less intimate and less enjoyable than the interactions of people with low RII scores. In addition, the participants reported that their interaction partners were less responsive, and the participants felt less influential and confident in these interactions than the low RII group. High scorers reported fewer interactions with the opposite sex, and fewer interactions per day overall, than lower scorers did. Males' socio-emotional satisfaction varied more due to risk in intimacy in same-sex interactions than it varied in interactions with females; however, women's reactions to interactions with men depended more on perceived risk in intimacy than did their interactions with women.

Pilkington and Woods (1999) used reaction time to evaluate the accessibility of risk in intimacy schemas in the minds of participants, asking them to rate relationship events (such as being "dumped" by a partner) as risky or not risky on a computer task. The authors recorded response time in the experiment to represent access to these schemas. They found that high risk perceivers rated risky events as more likely than low risk perceivers. For non-risky events, high risk perceivers deemed them as presenting more risk more often than low risk perceivers did. In the second part of the experiment, participants were presented with some ambiguous situations, such as being invited to a deli with a group of people. The researchers found that high risk perceivers rated the ambiguous situations as more risky than did low risk perceivers.

High perception of risk in intimacy may make people less likely to cooperate due to their lack of vulnerability in social interactions. In addition, the findings illustrate that the high risk perceivers may perceive opportunities to cooperate for mutual gain as being riskier than they

truly are. In contrast, low risk perceivers may cooperate more easily, due to more satisfaction from doing so.

Trait loneliness (hereafter "loneliness") is the second proposed factor relating to cooperation. It can be understood as one's tendency to feel chronically lonely (Van Roekel, Verhagen, Engels, Scholte, Cacioppo, & Cacioppo, 2016). Vanhalst, Luyckx, van Petegem, and Soenens (2018) gave participants social inclusion vignettes (such as an invitation to a concert), and asked participants the likelihood that they would accept the invitation to be included in the scenario. The researchers also had participants rate five types of motivation which included amotivation (seeing no value in a social event) and external regulation (a pressure from the outside to act) to accept the invitation. They also assessed nine cognitive emotion strategies (such as rumination—focusing on negative aspects of a situation—and catastrophizing of the self—overthinking internal issues and viewing them out of proportion). Vanhalst et al. (2018) found that lonely participants were less likely to accept the inclusion invitations conveyed in the vignettes, which contradicts a common assumption that lonely people jump at opportunities to interact socially. Additionally, the researchers found that some types of motivation correlated negatively with loneliness. Specifically, external pressure and amotivation were associated with lonelier people. Thus, Vanhalst et al. (2018) inferred that the loneliness could be associated with a lack of eagerness and less intrinsic type of social motivation (such as amotivation). Moreover, lonelier people tended to ruminate about the negativity of adverse social situations, and tended to engage in catastrophic thinking about how bad the adverse situation would be.

Wiseman (1997) investigated the relationships that interpersonal interaction and self-definition have with loneliness among students adjusting to college. Wiseman based the experiment on Blatt's (1990) Model of Personality Development, which pinned personality

development on interpersonal interaction, defined as the ability to form mature and satisfying relationships, and self-definition, defined as the ability to hold a realistic but positive view of the self. The participants were periodically given a set of questionnaires during their first year of college, and revealed in their answers a link between loneliness and harsh self-criticism. That was especially true for the participants who revealed they were still lonely in the middle of the year, and were feeling unsatisfied with themselves and their achievements. Surprisingly, however, the study also revealed that interpersonal interaction was unrelated to loneliness, leading the author to postulate that the lack of satisfaction one yields from existing relationships is what leads people to lonely feelings.

Majorano, Musetti, Brondino, and Corsano (2018) looked into proposed reasons behind two specific subsets of loneliness in adolescents: peer-related loneliness, defined as loneliness amongst other peers, and parent-related loneliness, defined as feelings of isolation from parents and family. They gave adolescents a series of questionnaires, and found that people who were exploring and learning about their identity tended to face both parent-related loneliness and peer-related loneliness. They also found that detachment (having emotional autonomy) contributed to peer-related loneliness.

Van Roekel et. al (2016) found support for the differential reactivity hypothesis across various ages and cultures. This hypothesis posits that the way lonely people respond to their environment maintains their state of loneliness. In comparison to non-lonely people, lonely people may feel much more lonely when they are by themselves than when they are with close friends. The researchers evaluated this hypothesis by looking at levels of trait and state loneliness in a variety of daily and social contexts. In the study, American and Dutch adolescents were given pagers that rang them randomly for a week to remind them to fill out questionnaires about

their levels of loneliness and experiences at the time of paging. The results indicated that lonely adolescents react more positively when they are around close others than when around people they are less familiar with, implying that loneliness can be mitigated by closer, communal bonds to forge better relationships than with someone the lonely adolescent is less familiar with.

Thus, lonely people may be less open to cooperation unless the person is a close member of their social network. Furthermore, lonely people may cooperate less due to prior lack of satisfaction from doing so. Past studies also illustrate how the social environment can dictate the level of loneliness one feels.

A final factor that could influence cooperative behavior is the nature of the relationship. A communal relationship is one that is need-based in which two people offer help in response to each other's needs, regardless of how much each of the two people has helped previously. Such a response pattern is found among family, friends, and significant others (Clark & Mills, 1979). In contrast, exchange relationships are based on giving help and resources reciprocally, where favors done for one another are closely tracked and exchanged at a one-to-one ratio between two people. This pattern of behavior can be seen in more formal interactions in public (Clark & Mills, 1979). Clark and Mills conducted a series of experiments to investigate these phenomena.

Clark, Gotay, & Mills (1974) measured participants' acceptance of help. Participants had to make an object out of balloons while a confederate of either similar values or dissimilar values watched. The balloons had to be blown up, so the confederates offered the participants assistance to prepare them for the study, allowing the participants to give the confederates any number of balloons to blow up as a measure of acceptance of the help. The participant was also told that the other person would create an object out of either wound coat hangers (leaving an opening for the participant to help unwind them) or already unwound hangers (no room to help). Consistent with

the experimenters' hypothesis, participants accepted more help when the confederate's values were similar to their own and when they had a chance to repay the confederate. As also predicted, when participants did not have an opportunity to repay, they accepted more help when values were different from those of the confederate. These findings illustrate how certain attributes of one's partner, as well as the dynamic between two people, can alter a person's behavior.

Clark and Mills (1979) then directly experimented on the communal and exchange relationship concept, hypothesizing that asking for a favor after receiving a favor would result in more attraction in an exchange relationship, but less attraction in a communal relationship. The researchers manipulated the type relationship by telling the male participant an attractive female confederate in their study was either married (exchange condition) or not married and interested in meeting people (communal condition), after which the participants helped the confederate complete a task. Both participants and confederates received points for completing their tasks, so after helping the confederate, the participant would either receive one of the confederate's points (a benefit for helping) or receive a simple thank you note (no benefit for helping) in return. The hypothesis was supported: the participants in the exchange condition reported more attraction when favors were reciprocated than did the participants in the communal condition. A secondary prediction—that the confederate asking for a favor before giving a benefit would lead to less attraction for participants in an exchange relationship than for those in a communal relationship—was also supported by the findings.

Following up on these findings, Clark and Mills (1986) conducted a literature review on communal and exchange relationships, specifically evaluating potentially exploitative communication for each. The researchers reasoned that, in a communal relationship, overstating

one's own needs and undermining the needs of the other person may be deemed exploitative communication. In contrast, exaggerating the favors one has given the other and minimizing the favors one has received could be considered exploitative communication in an exchange relationship.

In the same year, Clark, Powell, and Mills (1986) investigated how individuals kept track of the needs of their partner in a relationship, hypothesizing that people seeking a communal relationship would pay more attention to the needs of others if they had no chance to reciprocate than if they did have that opportunity. Additionally, the experimenters tested the idea that, regardless of having or not having an opportunity to reciprocate, participants would track needs the same way if a communal relationship is desired. A subsequent prediction was that, when an opportunity to return a favor was present, keeping track of needs would be greater for exchange relationship seekers than communal relationship seekers.

Clark et al. (1986) used information on a questionnaire to manipulate the communal versus exchange relationship, depicting a confederate as single woman looking to meet people (communal) or a married woman (exchange). Participants were given a problem-solving task to complete while the confederate was given a more difficult task. The participant was told the confederate could ask for help on the task, and that the participant must check to see if the confederate had done so by leaving a note in a box (the number of box checks measured how much the participant kept track of the confederate's needs). The experiment validated all three hypothesis. Without the chance to reciprocate, participants kept track of needs more if they wanted a communal relationship than if they wanted an exchange relationship. Regarding the relationship types, if participants wanted a communal relationship, how closely they kept track of

needs was not altered by the opportunity to reciprocate. Participants seeking an exchange relation kept track of needs more if the opportunity to return favors existed than if it did not.

Clark, Mills, and Corcoran (1989) investigated a similar hypothesis that people would pay more attention to the needs of a friend than of a stranger; on the other hand, it was expected that participants would be more mindful of how much effort a stranger was putting into a joint task relative to their own, compared to how much they would track the effort someone they knew was putting into the task. In the exchange-oriented condition, lights were used to signify that the other person had put in a lot of effort into a task; in the communal-oriented condition, lights were used to signal that the other person needed help on his or her end of the task. Participants looked more frequently at the lights when they indicated a friend's needs and a stranger's effort than when they indicated a stranger's needs and a friend's effort, falling in line with the initial hypothesis.

Subsequently, Clark, Dubash, and Mills (1998) conducted a series of three experiments to test the hypothesis that the interest a person shows in another person's consideration of his or her needs is emphasized more in a communal relationship than an exchange relationship. All three studies ran a similar manipulation as the experiments mentioned previously, depicting an unmarried individual looking to meet people for the communal relationship, and a married person looking to complete the study at a convenient time for the exchange condition. Interest in the confederate's consideration of one's needs was expected to be higher for participants seeking a communal relationship than it was for those seeking an exchange relationship.

In the first two studies, the researchers measured the interest in another's consideration by seeing how often the participant looked at lights, which signified the time the confederate spent selecting and giving task hints to the participant (Clark et al., 1998). They then collected

ratings depicting how interested the participant was in knowing how long the confederate spent on the hints. The third study evaluated the participant's interest in their partner's consideration by collecting ratings measuring how interested the participant was in the time their partner took to select a gift for him or her and in knowing if another person received the same gift. Interest in another's consideration for one's needs was seen even when there was some level of uncertainty about the communal relationship itself.

Communal and exchange relationships have been shown to dictate how people approach interactions with others. This may lead to people treating the opportunity to cooperate differently based on the different expectations that arise with the two types of relationships. Loneliness and perceived risk in intimacy might impact cooperation differently based on the type of relationship the participant experiences.

In the current study, the Prisoner's Dilemma experimental game will be used to judge cooperation in participants. The game is played between two people, and is designed to create a situation where each person, unaware of the choice of the other player, can either choose to cooperate for mutual gain, or betray the other person to maximize his or her own payout. Figure 1 displays a payoff table of the Prisoner's Dilemma, with the row player choosing between the actions "up" and "down," and the column player selecting between "left" and "right." The cooperative choices are "up" and "left," while the betrayal choices are "down" and "right."

Table 1
Depiction of the Prisoner's Dilemma Cooperative Game

	Column player cooperates	Column player betrays
Row player cooperates	8,8. Both cooperate.	0,10. Column betrays row.
Row player betrays	10,0. Row betrays column.	2,2. Both betray.

Nash (1951) later went on to investigate the predicted outcome in the Prisoner's Dilemma game, developing a concept applicable to a plethora of economic simulations known as the Nash Equilibrium. Nash defined the concept of the Nash Equilibrium as an outcome where none of the players regret their decision after learning of the choices of other players. For example, in the above simulation, the Nash Equilibrium outcome is "down, right," in which the column player will earn a higher payoff in the long term choosing "right" than "left" if the row player chooses "down." The row player is better off choosing "down" than "up" if the column player chooses "right." This concept made the Prisoner's Dilemma a good medium for studying cooperation, as the optimal outcome in an iterated (repeated) Prisoner's Dilemma game is for both players to select "up" and "left," but defections from the cooperative strategy could eventually shift the outcome to "down" and "right," as the Nash Equilibrium concept depicts (Nash, 1951).

Rotenberg (1994) used the Prisoner's Dilemma game to investigate how loneliness and interpersonal trust are related to cooperation. Participants completed the revised UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980) and the Rotter Interpersonal Trust Scale (1967), and then played twenty rounds of the Prisoner's Dilemma game against a confederate playing with predetermined strategies. The confederate started with a preset order of choices, designed to represent exploration of the choices. After five rounds of this, the confederate used the tit-for-tat strategy, where he or she reciprocated the previous decision of the participant. The results illustrated a negative association between loneliness and trust in others' reliability based on the scale responses. Further findings depicted an increase in cooperative behavior across Prisoner's Dilemma trials for less lonely people, while lonely people did not become more cooperative over the course of the game. Similarly, the data also showed a correlation between one's trusting beliefs in others and trust in the partner to cooperate during the Prisoner's

Dilemma. This combination of findings seems to relate loneliness to cooperative behavior through a lack of trust in the partner, as well as in others overall.

Rotenberg (2004) conducted a similar experiment and compared loneliness and interpersonal trust for participants in the fourth and fifth grades. The study was comprised of giving the sample the Loneliness and Social Dissatisfaction scale (Asher, Hymel, & Renshaw, 1984), as well as the Children's Trust scale (Imber, 1971, 1973) to measure students' generalized belief in their peers. To demonstrate belief in their close peers, children were then asked to mention a student they spent a lot of time with and rated them on their ability to keep secrets and promises; simultaneously, the children's teacher recorded how likely each student was to confide information in, expect promises from, and overall trust his or her classmates. Rotenberg again had participants play the Prisoner's Dilemma game to measure their trust in reciprocal behavior, and found a negative correlation between loneliness and trust in peers overall, as well as trust in peers of the same gender and close peers specifically. Loneliness also correlated negatively with reciprocal cooperative behavior in the Prisoner's Dilemma game, lending support to the idea that lonely people do not tend to cooperate with others due to their familiarity with isolation.

The current study is an investigation into how perceptions of social interactions correlate with one's willingness to cooperate in settings involving mutual gain. Experimentally, the design is comprised of a manipulation similar to Clark and Mills' (1979) exchange and communal relationship conditions, characterizing a confederate as someone open to one or the other kind of relationship. The relationship status of the confederate was changed from Clark and Mills' version of "married" to "engaged" in order to depict a more realistic situation based on norms of the participant sample. The Prisoner's Dilemma task provides a sound measure of participants'

willingness to cooperate, offering avenues of mutual gain and an incentive to betray one's partner for individual reward.

The goal of the current experiment is to evaluate whether perceived risk in intimacy, trait loneliness, and communal versus exchange relationships influence cooperation. Table 2 summarizes the hypotheses being tested. It is predicted that participants in the communal groups will cooperate more than participants in the exchange groups, less lonely people will cooperate more than lonelier people, and lower risk perceivers will cooperate more than higher risk perceivers. We expect these main factors to have interaction effects, contingent on the manipulation of communal and exchange relationships.

We predict that, in the communal condition, low RII people will cooperate more than high RII people because of their willingness to be more open to the other person when a possible relationship is involved. We also predict that high RII people who are lonely will cooperate less than the low RII, less lonely people because the former group is both less willing to be vulnerable when intimacy may be present and is alone more often than latter group, which is more inclined to seek a relationship.

In the exchange condition, we predict a loneliness effect whereby lonely people are less cooperative due to their tendency to operate by themselves. We predicted no difference in cooperation based on RII in this condition, as the opportunity for a relationship is not presented.

Table 2

Table of Hypotheses in Current Study

Relation condition	Communal		Exchange	
RII	High	Low	High	Low
Lonely	→		=	
Not Lonely	→		=	

Note: Each arrow compares two cells, and points to the cell predicted to cooperate more.

Methods

Participants:

Participants were recruited from introductory psychology and linguistics courses at William & Mary. Students were chosen from mass testing surveys to create an appropriate distribution of individuals who are either high or low in loneliness, and who perceived either high or low levels of risk in intimacy. People currently in romantic relationships were removed from the sample, as the manipulation is designed to invoke opportunities for intimacy for people who do not currently have that from a romantic relationship. The average age of the sample was 19.04 years (SD = .95). In total, 57 students participated in the experiment. Two were removed due to prior interactions with the confederate.

Measures:

The Perceived Risk in Intimacy scale (see Appendix A) is a measure designed to assess the extent to which people see close relationships as threatening and dangerous (Pilkington & Richardson, 1988). It was used to gauge participants' perception of risk in intimacy, and categorize them into high RII and low RII groups. The revised UCLA Loneliness Scale (see

Appendix B) was used to measure participant loneliness (Russell, Peplau, & Cutrona, 1980) and dichotomize the pool into lonely and non-lonely groups based on the scores.

Procedure:

The participant and a confederate (of the opposite sex of the participant) reported simultaneously to the testing location, with the confederate pretending to be a second participant in the study. Participants were told they would be filling out questionnaires, and playing an interactive game with each other on paper. The study was introduced as evaluating interpersonal gameplay in William & Mary students. Each entered one of two separate, adjacent rooms, where the participant filled out the informed consent form under the assumption that the confederate did the same.

Upon completing the consent form, the participant was then asked to fill out a pre-session questionnaire, under the guise that the experimenters were interested in seeing if knowing minimal information about one's game partner would influence a participant's game play. Once completed, the participant's questionnaire was collected and taken to the "other participant" (i.e., the confederate) for review. The experimenter returned with the confederate's supposed questionnaire and gave it to the participant to read over.

The confederate's questionnaire revealed that the person, of the opposite sex, was either single for the communal group or engaged for the exchange group (Clark & Mills, 1979). Similar to the methods employed by Clark and Mills, the current study manipulated the relationship using the following responses on the pre-screening questionnaire:

For the communal group, the confederate's questionnaire listed the following answer to the question: "Why did you sign up for the study?"

"I think it will be interesting. I'm new at the college, I don't know many people, and I thought it might be a good way to meet people" (Clark & Mills, 1979, 15).

For the exchange group, the confederate's questionnaire stated:

"I've been at the college for two years. I signed up for this experiment because it's scheduled at a convenient time and my fiancee can pick me up afterwards" (Clark & Mills, 1979, 15).

Next, the experimenter read the instructions for how to play the game to the participant. Included in this explanation was the payoff table for both players and information that each player's outcome would be affected by the choice of the other player. Additionally, the participant was told that, following the participant's choice in each round, he or she would learn of the confederate's choice in the round and the subsequent payoff. The participants were told the total number of points each person had would translate to different levels of prizes after the experiment ended. Because Axelrod (1997; 2006) has shown that people tend to change their behavior as the game comes to an end, the number of rounds was not disclosed to the participant to avoid any changes in behavior that might come from anticipating the end of the game. The participant played the game for 12 rounds; in each round he or she selected one of the two rows in the payoff table pictured below:

Table 3
Table Outlining Prisoner's Dilemma Game

	Left	Right
Top	6,6	0,8
Bottom	8,0	2,2

Upon selecting a row choice, they were told which column was selected by the "other player." In order to standardize the confederate's behavior across conditions, the decisions made by the confederate were generated randomly. This produced the following order of confederate choices: left, right, left, right, right, left, right, left, right, right, left, left. The participant recorded his or her choice, the confederate's choice, and each player's payoff for each round.

After playing twelve rounds, the game was ended. Participants were given a manipulation check (Clark & Mills, 1979) described to them as a post experiment questionnaire. The check required participants to consider their interaction with their partners and posed seven questions oriented to a communal relationship and seven oriented to an exchange relationship (see Appendix C). In debriefing, the participants were told that the game was designed to test whether loneliness and perceived risk in intimacy are associated with varying levels of cooperation, given the manipulation of communal or exchange relationship. They were also told that the proclaimed "second participant" was a confederate, and that his or her choices in the game were randomly generated. Lastly, participants were awarded a pen as a general payment for the study in lieu of the aforementioned prize.

Results

Each participant could have cooperated a maximum of 12 times in the study by choosing the top row option in the Prisoner's Dilemma game payoff table. On average, the participants cooperated on 4.37 of the trials. This is consistent with the findings by Roterberg (1994), where participants cooperated less than half the time.

To analyze the number of times a participant chose the cooperative choice as the dependent variable, a 2 (Perceived Risk in Intimacy) x 2 (Loneliness) x 2 (Relationship Type) analysis of variance (ANOVA) was calculated. The main effect hypotheses—stating that high

RII people, lonely people, and people in the exchange condition would cooperate less than low RII people, less lonely people, and people in the communal condition, respectively—were not supported. The two-way interaction between RII and relation type was not significant. As can be seen in Table 4, a predicted three-way interaction effect was not statistically significant.

Table 4
Table of Means and Standard Deviations of Number of Cooperative Choices for Each Group

	Communal	Communal	Exchange	Exchange
	High RII	Low RII	High RII	Low RII
Lonely	$M = 3.64$, $SD = 1.12$	$M = 4.00$, $SD = 1.31$	$M = 5.09$, $SD = 1.81$	$M = 4.38$, $SD = .916$
Non-Lonely	$M = 3.00$, $SD = 3.00$	$M = 6.67$, $SD = 2.94$	$M = 3.00$, $SD = 1.00$	$M = 3.75$, $SD = 5.19$

A marginally significant interaction was observed between RII and loneliness, $F(1, 53) = 3.33$, $p < .08$. As can be seen in Table 5, people who were less lonely cooperated more when they perceived low risk in intimacy than when they perceived high risk in intimacy. In contrast, lonely people cooperated roughly the same amount, regardless of how much risk in intimacy they perceived.

Table 5
Table of Means and Standard Deviations of Number of Cooperative Choices by RII, Loneliness

	High RII	Low RII
Lonely	$M = 4.36$, $SD = 1.65$	$M = 4.19$, $SD = 1.11$
Non-Lonely	$M = 3.00$, $SD = 2.00$	$M = 5.50$, $SD = 4.01$

A second marginally significant interaction was observed between loneliness and communal/exchange condition, $F(1, 53) = 3.30$, $p < 0.08$. As was predicted, lonely people cooperated more when they were in the exchange condition than when they were in the

communal condition (see Table 6). Less lonely people cooperated more when they were in the communal condition than when they were in the exchange condition. An interesting result stemming from this revealed that, in the exchange condition, lonely people were more cooperative than non-lonely people. This is a surprising outcome given that previous research (e.g., Rotenberg, 1994) found less cooperation from lonely people than from non-lonely people in the Prisoner's Dilemma. Because no potential for an ongoing relationship was raised in previous studies, one might assume those participants were operating under an exchange orientation. If so, the current findings contradict previous findings.

Table 6

Table of Means and Standard Deviations of Number of Cooperative Choices by Loneliness, Relation Type

	Lonely	Non-lonely
Communal	$M = 3.79$, $SD = 1.18$	$M = 5.44$, $SD = 3.32$
Exchange	$M = 4.79$, $SD = 1.51$	$M = 3.43$, $SD = 3.74$

Next, the manipulation questionnaire responses were broken down into two subscores. A communal score (a sum of the responses to questions 1, 2, 3, 5, 9, 13, and 14) and an exchange score (a sum of the responses to questions 4, 6, 7, 8, 10, 11, and 12) were calculated for each participant. Two one-way analysis of variance (ANOVA) were used to look for a main effect of relation type condition on the communal and exchange scores. The relation type effect was not statistically significant for either the communal or exchange score. Pearson correlations were calculated between RII and the communal score, $r(54) = .13$, and the exchange score, $r(52) = .03$. Both were non-significant, as were the correlations between loneliness and the communal score, $r(54) = -.07$, and between loneliness and the exchange score, $r(52) = .20$.

Discussion

It was hypothesized that less lonely people would cooperate more in the communal condition than the exchange condition, and more lonely people would cooperate more in the exchange condition than in the communal condition. This was marginally supported by the data. This outcome gave support to the idea that less lonely people are more open to forming new close relationships and thus collaborate more with another person when the opportunity to form these bonds is present. In contrast, lonely people appear to be averse to the possibility of intimacy and are more inclined to work with someone who seeks to obtain fair benefit for both people in the short-term. Additionally, participants who were lonely cooperated less in the communal condition, likely due to their affinity for isolation, as the exchange condition implied limited interaction with or consideration of the other person beyond the bare minimum amount.

Surprisingly, lonely people cooperated more than less lonely people in the exchange condition. The exchange manipulation may have made the lonelier people feel more comfortable—as stated above—in turn sparking a perceived understanding with the confederate that both were simply our for their short-term gain. On the other hand, less lonely people may have felt that the exchange condition implied that the other person was less willing to cooperate. In anticipation of this, less lonely participants may have selected the option to betray, in order to maximize the number of points assuming the confederate betrayed as well.

The interaction between loneliness and RII proved marginally significant. This indicates that when people were lonely, high and low risk perceivers did not differ in how cooperative they were. When not lonely, however, high risk perceivers were less cooperative than low risk perceivers. This may be because lonely people simply prefer not to cooperate and would rather work alone to maximize their gain. In this case, perceived risk in intimacy would not seem to

make a difference in their behavior. On the contrary, people who are less lonely are more familiar with working in groups in a social setting and would be more open to cooperating. Low RII people who are not lonely will likely be unfazed by any social risk that potential intimacy may create in a cooperative setting, whereas high RII people who are not lonely may still be hesitant to cooperate because of the social risk they perceive from the interaction.

On the other hand, high RII people in the communal treatment did not cooperate significantly more than low RII people, failing to support the hypothesis that low RII perceivers will allow themselves to be more vulnerable to possible betrayal by cooperating more as compared to high RII perceivers. No RII, loneliness, or relation condition main effects were significant, failing to support our hypotheses that low RII people, non-lonely people, and people in communal group cooperate more than high RII people, lonely people, and people in the exchange group. The three-way interaction effect between the three variables was also not statistically significant.

One explanation for these null findings is the lack of statistical power in the study. Obtaining data from only 54 participants inhibited the power of the study and studying a larger sample may have yielded more statistically significant effects. Additionally, an unequal distribution of gender across conditions could cause some error in modelling the effects. The sample was primarily female, and many of the cells had more data from females than from males. Pilkington and Richardson (1988) found mixed evidence that men perceive more risk in intimacy than women do, which, if true, could skew the data and may explain some of the null findings. Men and women might potentially act differently when they are lonely as well, offering further room for error. Another methodological explanation for these null findings relates to the effectiveness of the manipulation check. The analysis of variance for each of the manipulation

check scores (communal score and exchange score) did not produce statistically significant differences, and the correlations between RII and loneliness and the communal and exchange scores were also not significant. Though none of the correlations were statistically significant, the manipulation questionnaire may be seen as a metric for preexisting individual differences—people approach relationships in their everyday lives—instead of a reflection of the way the participant approached the experiment.

Furthermore, the Prisoner's Dilemma game may offer other explanations for these null findings. One issue with the game may have been the choice to use a randomly generated strategy. This was done to standardize the confederate's behavior across conditions. However, Rotenberg (1994) used the tit-for-tat strategy when conducting a similar study, which may have allowed participants to cooperate with more certainty than a randomly generated set of responses did. Another issue may have had to do with the complexity of the game itself. A nuanced simulation that stems from economic research, the Prisoner's Dilemma game may have been understood differently by different participants, even if the explanation of the game was the same. Some participants may have missed the idea that one of the choices was cooperative and one was a betrayal.

In their studies, Clark and Mills presented more direct choices for participants to cooperate by having them assist the confederate in a task (1974) or directly give the confederate points (1979), clearly defining which choice was cooperative and which was not. The participants in the current study betrayed the confederate over half the time on average. Making the difference between cooperating and not cooperating more clear in participants' choices may have created a more distinct difference between those who cooperated more and those who betrayed more. Similarly, the insignificant interaction between RII and the relation condition

may have been due to the design as well. It is possible that people failed to interpret the interaction as having any intimate aspect to it. Participating in a short study with limited interaction with the other individual may not have given the participants the indication that they were in a potentially intimate situation.

Beyond the methodological reasons, there are several theoretical explanations for the null findings. In particular, the three-way interaction may not have proven significant because risk in intimacy may apply to more socially oriented situations, instead of playing a game to attain points. As such, even the communal condition manipulation may not have sparked the high RII people's aversion to potential risk. Furthermore, risk in intimacy may be better depicted with a concept like trust than cooperation. High RII people might be willing to cooperate with someone temporarily, but they may not necessarily trust the person beyond the scope of the experiment. Similarly, Rotenberg (2004) found a negative correlation between loneliness and trust, and a positive correlation between trust in others and cooperation, giving more credence to the idea that cooperation may simply be seen as a potential byproduct of trust in others.

The implications of these findings, and the potential theoretical explanations, are that people's cooperation with others may depend on both in how much risk in intimacy people perceive and how lonely they are. These findings also contribute to communal versus exchange relationship research, giving credence to the concept of loneliness as a potential predictor of cooperation in these two types of interactions. The effect these two interactions have on cooperation—as well as on behaviors studied in prior communal versus exchange research—may depend on the loneliness of the individual.

Based on the findings and on previous literature, the concept of trust may reflect more the expected effects of the present study than cooperation. Cooperating with another person may be

better seen as one of several behaviors that result from trust, such as disclosing personal information or giving someone responsibility for valuable items, among others. As a result, the original hypotheses and expected associations between risk in intimacy, loneliness, and relation condition should be adapted to consider trust instead of cooperation. Though some of the expected correlations were found to be marginally significant—and more may prove to be significant with a larger sample—measuring trust as a function of RII, loneliness, and the relation condition may yield more significant findings as a future direction of study.

Another future direction for research lies in continuing the current study with a larger, more diverse sample size for adequate power to draw conclusions, as stated above. The marginally significant interaction effects between (a) RII and loneliness, and (b) loneliness and relation condition, should be investigated further in the context of cooperation, potentially with participants' choices more directly reflecting cooperation and betrayal. Future studies on the association between loneliness and the relation condition might further solidify the predictions based on prior literature. Knowledge of the validity of these interactions may yield a better understanding of why lonely people's cooperation fluctuates depending on their perceived RII in settings of mutual gain.

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Appendix A

Listed below are several statements that reflect different attitudes about relationships. Some of the items refer to general attitudes or beliefs about relationships. Other items refer to more specific kinds of interactions, such as those with acquaintances (e.g., someone you've met only once, someone you know only from class), with casual friends, or with people you are very close to.

Using the scale below, indicate the extent to which you agree with each statement by writing the appropriate number in the blank beside each item.

1 = very strong disagreement	4 = slight agreement
2 = moderate disagreement	5 = moderate agreement
3 = slight disagreement	6 = very strong agreement

There are no right or wrong answers. This is simply a measure of how you feel. Please try to give an honest appraisal of yourself.

_____ 1. It is dangerous to get really close to people.
_____ 2. I prefer that people keep their distance from me.
_____ 3. I'm afraid to get really close to someone because I might get hurt.
_____ 4. At best, I can handle only one or two close friendships at a time.
_____ 5. I find it difficult to trust other people.
_____ 6. I avoid intimacy.
_____ 7. Being close to other people makes me feel afraid.
_____ 8. I'm hesitant to share personal information about myself.
_____ 9. Being close to people is a risky business.
_____ 10. The most important thing to consider in a relationship is whether I might get hurt.
_____ 11. I feel lonely.

Appendix B

Directions: Indicate how often you feel the way described in each of the following statements. Circle one number for each

1. I feel in tune with the people around me.	1	2	3	4
2. I lack companionship.	1	2	3	4
3. There is no one I can turn to.	1	2	3	4
4. I do not feel alone.b	1	2	3	4
5. I feel part of a group of friends.b	1	2	3	4
6. I have a lot in common with the people around me.b	1	2	3	4
7. I am no longer close to anyone.	1	2	3	4
8. My interests and ideas are not shared by those around me.	1	2	3	4
9. I am an outgoing person.b	1	2	3	4
10. There are people I feel close to.b	1	2	3	4
11. I feel left out.	1	2	3	4
12. My social relationships are superficial.	1	2	3	4
13. No one really knows me well.	1	2	3	4
14. I feel isolated from others.	1	2	3	4
15. I can find companionship when I want it.b	1	2	3	4
16. There are people who really understand me.b	1	2	3	4
17. I am unhappy being so withdrawn.	1	2	3	4
18. People are around me but not with me.	1	2	3	4
19. There are people I can talk to.b	1	2	3	4
20. There are people I can turn to.b	1	2	3	4

Appendix C

Pre-experiment Questionnaire

1. First Name: _____
2. Age: _____
3. Gender: _____
4. Major or Intended Major: _____
5. How many brothers do you have? ___
6. Ethnicity (Circle one):
   White Hispanic/Latino African American Native American Asian Other
7. How many sisters do you have? ___
8. Relationship Status: _____
9. On an average day, how much time do you spend on social media (in hours)? ___
10. Why did you sign up for this study?

Appendix D

Post-experiment Questionnaire

Please use the scale below to indicate your thoughts about the person you played the game with:

1	2	3	4	5
Disagree Strongly				Agree Strongly

1. I wouldn't bother keeping track of benefits given to him or her: ___
2. I would enjoy responding to his or her needs: ___
3. I would refuse if he or she offered me a repayment for something I had done: ___
4. If I gave something of value to him or her, I would expect him or her to return it soon afterwards: ___
5. I would enjoy him or her responding to my needs: ___
6. He or she is the sort of person to whom I definitely wouldn't tell my troubles: ___
7. I wouldn't be any more sensitive to his or her needs than to anyone else' needs: ___
8. In a relationship with him or her, it would be best to keep things as "even" as possible: ___
9. I would want to do things to please him or her: ___
10. If I received something valuable from him or her, I would immediately return something comparable: ___
11. If he or she helped me, he or she would have to be paid back immediately: ___
12. It would be best for me not to get involved in taking care of his or her needs: ___
13. I would enjoy doing things to please my him or her: ___
14. I would resent it if he or she did me a favor and then asked for a repayment: ___